NACA RM A53K20

NACA

RESEARCH MEMORANDUM

INVESTIGATION OF A TRAILING-EDGE PADDLE-CONTROL SURFACE

ON A TRIANGULAR WING OF ASPECT RATIO 2 AT

SUBSONIC AND SUPERSONIC SPEEDS

By Louis H. Ball

Ames Aeronautical Laboratory
Moffett Field, Calif.

NATIONAL ADVISORY COMMITTEE
FOR AERONAUTICS

WASHINGTON
February 2, 1954

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

RESEARCH MEMORANDUM

INVESTIGATION OF A TRAILING-EDGE PADDLE-CONTROL SURFACE

ON A TRIANGULAR WING OF ASPECT RATIO 2 AT

SUBSONIC AND SUPERSONIC SPEEDS

By Louis H. Ball

SUMMARY

Presented herein are the results of an experimental investigation of external airfoils, known as paddle-control surfaces, as the longitudinal control device on a triangular wing of aspect ratio 2. The lift, drag, pitching moment, and hinge moment were obtained for Mach numbers of 0.60, 0.80, 0.90, 1.20, 1.30, 1.50, 1.70, and 1.90 at a constant Reynolds number of 3.0×10^6, for angles of attack from about -4° to 18° and for paddle-control deflections from approximately 4° to -16°.

Examination of the control-surface characteristics of the paddle control and comparison of the control-surface parameters with a conventional trailing-edge unbalanced flap having the same area revealed the following results:

No unusual variations were noted in the pitching-moment or hinge-moment characteristics throughout the speed range tested. The pitching-moment effectiveness of the paddle control at subsonic speeds was considerably less than that of the unbalanced flap. At supersonic speeds, the pitching-moment effectiveness of the paddle control was less than that of the unbalanced flap at Mach numbers below 1.50; whereas, above a Mach number of 1.50, the effectiveness of the two types of controls corresponded closely. The results showed that material reductions in the hinge-moment parameters, C_{h_δ} and C_{h_α}, were realized with the paddle control. There was little effect of Mach number on these hinge-moment parameters.

The use of the paddle control resulted in increases in the minimum drag coefficient throughout the speed range investigated.

C_{h_δ} rate of change of hinge-moment coefficient with change in control deflection for constant angle of attack, $\frac{\partial C_h}{\partial \delta}$, measured at $\delta = 0°$, per deg

C_{h_α} rate of change of hinge-moment coefficient with change in angle of attack for constant angle of control deflection, $\frac{\partial C_h}{\partial \alpha}$, measured at $\alpha = 0°$, per deg

l length of body including portion removed to accommodate sting, ft

M Mach number

M_A first moment of area of exposed flap area aft of hinge line of the unbalanced flap,[1] ft^3 (see ref. 1)

q free-stream dynamic pressure, $\frac{\rho V^2}{2}$, lb/sq ft

R Reynolds number, based on mean aerodynamic chord

r_0 maximum body radius, ft

S wing area, including area within body, sq ft

V velocity of free stream, ft/sec

x longitudinal distance from nose of body, ft

y distance perpendicular to vertical plane of symmetry, ft

α angle of attack of wing chord line, deg

δ angle between wing chord and control chord measured in a plane perpendicular to the control hinge line, positive for downward deflection with respect to the wing, deg

ρ mass density of air, slugs/cu ft

Subscript

n nominal control angle

[1] In order that the hinge-moment coefficients of the paddle control and the unbalanced flap could be compared, the hinge-moment coefficients of the paddle control were computed using the moment of area of the unbalanced flap of reference 1.

APPARATUS AND MODEL

The Ames 6- by 6-foot supersonic wind tunnel in which this investigation was conducted is a closed-return, variable-pressure wind tunnel with a Mach number range from 0.60 to 0.90 and from 1.20 to 2.00. Further information on this wind tunnel can be found in reference 2.

The model consisted of a wing-fuselage combination employing a wing of triangular plan form of aspect ratio 2 symmetrically mounted on the fuselage. The wing had NACA 0005-63 airfoil sections in streamwise planes.

The paddle control consisted of two sharp-edge rectangular surfaces (fig. 1). One of the paddles was positioned above and the other was positioned below the trailing edge of the right wing by a pair of struts which attached the paddles rigidly together and positioned each paddle 1.30 inches from the chord plane of the wing. The struts were pivoted about an axis in the chord plane of the wing which corresponded to the 30-percent-chord line of the paddles as a means of obtaining various deflection angles. When the control was undeflected, the trailing edges of the two paddles were in the same plane as the wing trailing edge. The streamwise airfoil section of the paddles was a half circular arc with the convexity on the side opposite to the wing. The maximum thickness-chord ratio was approximately 5 percent at the 50-percent chord. The area of the two paddles combined equalled approximately 14 percent of the area of the right wing panel including that portion enclosed within the body.

The wing and paddle control were of solid steel construction. The body had a fineness ratio of 12.5 based on the length including that portion shown dotted in figure 1.

The forces and moments on the model were measured by an electrical strain-gage balance. Paddle-control hinge moments were measured by an electrical strain gage mounted within the wing.

TEST AND PROCEDURE

The aerodynamic characteristics of the model as a function of angle of attack were investigated for a range of Mach numbers from 0.60 to 0.90 and from 1.20 to 1.90. The data presented were obtained at a Reynolds number of 3.0×10^6. Lift, drag, pitching-moment, and hinge-moment measurements were made at constant paddle-control deflections for angles of attack from about -4° to 18°. The paddle-control deflections were varied from 4° to -16°. In some instances, the full range of

angles of attack was not obtained because of structural limitations or
other difficulties.

Reduction of Data

The test data have been reduced to standard NACA coefficient form.
The pitching moments were calculated about an axis at 35 percent of
the mean aerodynamic chord. A complete discussion of the methods used
in reducing the wind-tunnel data to coefficient form and the various
corrections applied to the results may be found in reference 1 and
only brief mention will be made here.

The data obtained in the Ames 6- by 6-foot supersonic wind tunnel
have been corrected for the following factors:

1. Induced effects of the tunnel walls at subsonic speeds result-
ing from lift on the model.

2. The change in the airspeed in the vicinity of the model at sub-
sonic speeds resulting from the constriction of the flow by the tunnel
walls.

3. The pressure at the base of the model at supersonic and sub-
sonic speeds being affected by the support interference. To account
partially for this effect, the base pressure was measured and the drag
coefficient was adjusted to correspond to that in which the base pres-
sure would be equal to the free-stream static pressure.

4. The longitudinal force on the model at subsonic and supersonic
speeds due to the streamwise variation of the static pressure as meas-
ured in the empty test section.

A survey of the 6- by 6-foot wind tunnel also indicated nonuni-
formities of the air stream in the pitch plane of the model equivalent
to a stream angle of as much as 0.10°. No correction to the data was
made for this effect.

Precision

The uncertainties involved in determining dynamic pressure and in
measuring forces with the strain-gage balance are described in refer-
ence 3. The following table lists the uncertainty introduced into each
corrected coefficient by the known uncertainties in the measurements:

Quantity	Uncertainty
Lift coefficient	±0.002
Drag coefficient	±.001
Pitching-moment coefficient	±.002
Hinge-moment coefficient	±.004
Mach number	±.01
Reynolds number	±.03 × 10^6
Angle of attack	±.10°
Flap deflection angle	±.25°

RESULTS AND DISCUSSION

The results of the investigation of the paddle control are presented in tabular form for the complete range of test variables in table I. The data presented in the table are for the model equipped with a paddle control on the right wing panel. For the purpose of analysis, a representative portion of the data is presented in graphical form.

Figure 2 shows the variation of the pitching-moment and the hinge-moment coefficients with paddle-control deflection for given angles of attack and with angle of attack for given paddle-control deflections. Only the data for the representative Mach numbers of 0.60, 0.90, 1.30, and 1.90 are presented. The results shown in figure 2 are for deflections of the paddle control on the right wing panel. The data reveal no unusual variations of the pitching-moment and the hinge-moment coefficients with either angle of attack or angle of deflection throughout the speed range of these tests.

The pitching-moment-effectiveness parameter, C_{m_δ}, the hinge-moment parameters, C_{h_δ} and C_{h_α}, and the minimum-drag coefficient of the paddle control are presented as functions of Mach number in figure 3. For purposes of comparison, the corresponding data for the unbalanced flap configuration of reference 1 are also presented in figure 3. Although data were obtained for the paddle control on only the right wing panel, the results, as presented in figure 3, are for the deflection of a control on both wing panels.

The pitching-moment effectiveness of the paddle control was less than the unbalanced flap at all speeds tested below a Mach number of 1.50; whereas, above the Mach number 1.50, the effectiveness of the two types of controls corresponded closely. The marked loss in pitching-moment effectiveness, C_{m_δ}, of the paddle control from that shown for the unbalanced flap at subsonic speeds may be advantageous in reducing the sensitivity of the longitudinal control in this speed range. The reduced

effectiveness of the paddle control at subsonic speeds is believed due
to the absence of the additional lift induced on the forward portion
of the wing by the hinged flap. The decrease in effectiveness exhibited
by the paddle control at supersonic speeds below a Mach number of 1.50
is brought about as a result of the shock-expansion interference
between the paddles and the wing. This principle has been discussed
previously in reference 1 and will be only briefly related here. At
negative control deflections the lower surface of the upper paddle
propagates expansion waves which impinge on the wing surface. The
resulting increase in lift on the wing, being of the opposite sign to
that carried by the paddle due to control deflection, effects a net
reduction in the lift effectiveness, C_{L_δ}, of the paddle control and,
thereby, the pitching-moment effectiveness of the control. The paddle
mounted on the lower surface of the wing acts in an analogous manner
by virtue of the compression wave emitted from its upper surface. At
Mach numbers above 1.50, the paddle control was so located that the
shock waves emanating from the paddles do not strike the wing surface.
Therefore, at these Mach numbers, the pitching-moment effectiveness of
the two types of controls corresponded closely.

The preceding discussion must be acknowledged to be a simplification
of the flow phenomena involved. However, it is believed to describe the
primary cause for the differences in pitching-moment effectiveness
between the paddle control and the unbalanced flap.

The primary advantage of the paddle control over the flap-type con-
trol is evident in the hinge-moment characteristics. An examination of
figure 3 shows that material reductions are realized for both of the
hinge-moment parameters, C_{h_δ} and C_{h_α}, from that noted for the unbal-
anced flap throughout the speed range investigated. Figure 3 also shows
that there is little effect of Mach number on the hinge-moment parameters
of the paddle control. The small values of C_{h_α} noted for this control
can be attributed primarily to the influence of the wing surface which
causes the effective incidence of the paddles to be essentially the
same throughout the angle-of-attack range of the tests. This influence
of the wing on the paddles is consistent with the results of reference 1
which showed that the addition of a paddle balance to a conventional
trailing-edge unbalanced flap had little effect on C_{h_α} of the unbal-
anced control. Since this phenomenon is essentially independent of
speed, C_{h_α} is unaffected by Mach number (see fig. 3). The reduction
noted in C_{h_δ} was due in part to the aerodynamic balance incorporated
in the paddle control. The small effect of Mach number on C_{h_δ} is not
clearly understood. It would be expected that there would be an effect
of Mach number on the hinge moment due to flap deflection because of
the rearward shift in the center of pressure of the load on the control
surface with increasing Mach number. It is somewhat surprising that
this effect is not evident in the hinge-moment results.

The hinge-moment advantages of the paddle control were obtained with a penalty in the drag characteristics, as shown in figure 3. The results show that the paddle control exhibited higher minimum drag coefficients than the unbalanced flap throughout the speed range tested. It is of interest to note that, though the drag increment is fairly large, considerable improvement in the drag characteristics was realized for the paddle control of the present investigation over the paddle balance of reference 1 by reducing the paddle thickness.

CONCLUSIONS

Tests were made of a model equipped with a trailing-edge paddle-control device to determine its control characteristics at subsonic and supersonic speeds. The results were compared with the control characteristics of the unbalanced, trailing-edge flap of reference 1. Examination of the results revealed the following significant features:

1. The pitching-moment and hinge-moment characteristics of the paddle control showed no outstanding nonlinearities for the entire speed range studied.

2. The paddle control exhibited a smaller control effectiveness at subsonic speeds and at supersonic speeds below a Mach number of 1.50. Above the Mach number 1.50 the effectiveness of the two types of controls corresponded closely.

3. The hinge-moment parameters, C_{h_δ} and C_{h_α}, of the paddle control were considerably smaller than those of the unbalanced flap and were little affected by Mach number.

4. The paddle control increased the minimum drag throughout the speed range tested.

Ames Aeronautical Laboratory
    National Advisory Committee for Aeronautics
        Moffett Field, Calif., Nov. 20, 1953

REFERENCES

1. Boyd, John W., and Pfyl, Frank A.: Experimental Investigation of
   Aerodynamically Balanced Trailing-Edge Control Surfaces on an
   Aspect Ratio 2 Triangular Wing at Subsonic and Supersonic Speeds.
   NACA RM A52L04, 1953.

2. Frick, Charles W., and Olson, Robert N.: Flow Studies in the
   Asymmetric Adjustable Nozzle of the Ames 6- by 6-Foot Supersonic
   Wind Tunnel. NACA RM A9E24, 1949.

3. Hall, Charles F., and Heitmeyer, John C.: Aerodynamic Study of
   a Wing-Fuselage Combination Employing a Wing Swept Back 63°.-
   Characteristics at Supersonic Speeds of a Model With the Wing
   Twisted and Cambered for Uniform Load. NACA RM A9J24, 1950.

TABLE I.- AERODYNAMIC CHARACTERISTICS OF A TRIANGULAR WING EQUIPPED
WITH A PADDLE CONTROL. DATA FOR ONE PADDLE CONTROL. R = 3.0x10⁶

(a) Nominal $\delta = +4°$

M	α	C_L	C_D	C_m	C_h	δ
0.60	-4.16	-0.176	0.0176	0.001	-0.030	3.9
	-2.05	-.082	.0119	-.005	-.035	3.8
	-1.06	-.037	.0104	-.008	-.038	3.8
	-.53	-.014	.0100	-.009	-.039	3.8
	.47	.031	.0100	-.011	-.040	3.8
	1.00	.055	.0106	-.012	-.041	3.8
	2.06	.104	.0129	-.015	-.041	3.8
	4.16	.199	.0202	-.021	-.043	3.8
	6.26	.296	.0332	-.027	-.045	3.8
	8.36	.395	.0567	-.028	-.047	3.8
	10.47	.486	.0660	-.023	-.043	3.8
	12.58	.589	.1260	-.022	-.038	3.8
	14.69	.693	.1737	-.023	-.036	3.8
	16.81	.798	.2303	-.023	-.036	3.7
	17.87	.853	.2626	-.022	-.037	3.8
0.80	-4.19	-.185	.0194	.004	-.024	3.9
	-2.07	-.084	.0126	-.004	-.024	3.8
	-1.07	-.037	.0110	-.008	-.026	3.9
	-.53	-.015	.0104	-.009	-.031	3.8
	.48	.035	.0107	-.013	-.031	3.8
	1.01	.059	.0113	-.014	-.033	3.8
	2.08	.109	.0135	-.017	-.039	3.8
	4.19	.211	.0219	-.027	-.042	3.8
	6.31	.317	.0379	-.032	-.045	3.7
	8.43	.413	.0618	-.030	-.044	3.8
	10.54	.505	.0947	-.027	-.037	3.8
	12.67	.616	.1384	-.037	-.031	3.8
	14.80	.726	.1910	-.042	-.029	3.8
	16.93	.840	.2543	-.048	-.030	3.8
0.90	-4.21	-.198	.0226	.008	-.026	3.8
	-2.09	-.090	.0141	-.002	-.024	3.9
	-1.07	-.040	.0122	-.007	-.026	3.8
	-.53	-.023	.0116	-.009	-.025	3.8
	.48	.037	.0117	-.013	-.025	3.8
	1.02	.064	.0125	-.015	-.027	3.8
	2.09	.117	.0185	-.019	-.027	3.8
0.90	4.21	.228	.0255	-.029	-.028	3.8
	6.34	.342	.0442	-.038	-.035	3.8
	8.46	.433	.0697	-.036	-.039	3.8
	10.59	.539	.1057	-.040	-.030	3.8
1.20	-4.09	-.201	.0277	.030	-.029	3.8
	-2.03	-.097	.0184	.011	-.029	3.8
	-1.00	-.047	.0162	.003	-.029	3.8
	-.47	-.023	.0157	-.001	-.030	3.8
	.46	.025	.0156	-.009	-.031	3.8
	.98	.072	.0164	-.014	-.031	3.8
	2.02	.106	.0193	-.023	-.031	3.8
	4.08	.209	.0290	-.041	-.035	3.7
	6.14	.316	.0459	-.059	-.038	3.7
	8.20	.421	.0708	-.076	-.030	3.8
	10.27	.527	.1037	-.092	-.024	3.8
1.30	-4.09	-.185	.0293	.025	-.029	3.8
	-2.03	-.089	.0206	.008	-.029	3.8
	-1.00	-.044	.0183	.001	-.029	3.8
	-.53	-.022	.0178	-.003	-.028	3.8
	.45	.024	.0177	-.009	-.028	3.8
	.98	.048	.0185	-.013	-.028	3.8
	2.02	.097	.0215	-.022	-.028	3.8
	4.08	.193	.0306	-.037	-.028	3.8
	6.13	.290	.0461	-.052	-.029	3.8
	8.19	.382	.0685	-.067	-.028	3.8
	10.25	.476	.0983	-.081	-.026	3.8
	12.31	.567	.1345	-.094	-.023	3.8
1.50	-4.08	-.170	.0271	.023	-.020	3.8
	-2.03	-.083	.0188	.008	-.026	3.8
	-.99	-.041	.0164	.001	-.027	3.8
	-.53	-.020	.0155	-.002	-.027	3.8
	.45	.021	.0153	-.006	-.028	3.8
	.98	.044	.0163	-.012	-.029	3.8
1.50	2.02	.089	.0194	-.019	-.030	3.8
	4.07	.177	.0261	-.034	-.031	3.8
	6.12	.263	.0424	-.047	-.031	3.8
	8.18	.345	.0621	-.060	-.030	3.8
	10.23	.427	.0884	-.072	-.028	3.8
	12.29	.506	.1199	-.083	-.024	3.8
	14.35	.582	.1571	-.093	-.023	3.8
1.70	-4.07	-.156	.0257	.020	-.023	3.8
	-2.03	-.078	.0178	.008	-.023	3.8
	-.99	-.039	.0158	.002	-.023	3.8
	-.47	-.020	.0152	-.001	-.024	3.8
	.45	.018	.0152	-.006	-.024	3.8
	.98	.039	.0157	-.010	-.024	3.8
	2.01	.079	.0179	-.016	-.025	3.8
	4.06	.159	.0259	-.029	-.026	3.8
	6.11	.237	.0390	-.040	-.027	3.8
	8.16	.313	.0572	-.051	-.028	3.8
	10.21	.383	.0804	-.062	-.027	3.8
	12.26	.453	.1086	-.071	-.027	3.8
	14.31	.522	.1423	-.080	-.026	3.8
	16.37	.589	.1806	-.086	-.030	3.8
1.90	-4.06	-.142	.0247	.017	-.018	3.9
	-2.02	-.071	.0177	.007	-.018	3.9
	-.98	-.036	.0160	.002	-.018	3.9
	-.47	-.019	.0156	-.001	-.019	3.9
	.45	.015	.0155	-.006	-.019	3.9
	.97	.034	.0160	-.008	-.019	3.9
	2.01	.071	.0178	-.014	-.019	3.9
	4.05	.142	.0248	-.024	-.020	3.8
	6.09	.209	.0364	-.034	-.021	3.8
	8.14	.278	.0528	-.043	-.022	3.8
	10.18	.342	.0735	-.052	-.023	3.8
	12.23	.405	.0987	-.060	-.024	3.8
	14.27	.466	.1286	-.066	-.025	3.8
	16.32	.527	.1631	-.071	-.026	3.8
	17.35	.559	.1826	-.072	-.032	3.8

(b) Nominal $\delta = 0°$

M	α	C_L	C_D	C_m	C_h	δ
0.60	-4.16	-0.195	0.0184	0.011	-0.004	0
	-2.07	-.103	.0117	.006	-.006	0
	-.48	-.035	.0090	.002	-.008	0
	.45	-.007	.0088	-.001	-.009	0
	.98	.031	.0092	-.002	-.010	0
	2.04	.077	.0107	-.005	-.011	0
	4.14	.172	.0170	-.010	-.013	-.1
	6.24	.270	.0301	-.017	-.016	-.1
	8.34	.368	.0511	-.019	-.012	-.1
	10.44	.459	.0795	-.015	-.009	0
	12.55	.567	.1194	-.016	-.007	0
	14.66	.663	.1642	-.018	-.005	0
	16.77	.770	.2198	-.018	-.006	0
	17.83	.819	.2494	-.018	-.008	0
0.80	-4.19	-.205	.0201	.015	.001	0
	-2.09	-.109	.0121	.007	-.003	0
	-1.02	-.059	.0097	.004	-.004	0
	-.49	-.034	.0091	.002	-.004	0
	.45	.010	.0089	-.001	-.005	0
	.99	.034	.0094	-.003	-.005	0
	2.06	.083	---	-.006	-.006	0
	4.17	.185	.0190	-.014	-.009	0
	6.28	.290	.0336	-.022	-.015	-.1
	8.40	.388	.0576	-.021	-.014	-.1
	10.51	.475	.0882	-.019	-.015	-.1
	12.63	.591	.1321	-.030	-.022	-.1
	14.76	.695	.1816	-.034	-.022	-.1
	16.89	.808	.2426	-.042	-.023	-.1
	17.95	.862	.2760	.047	-.026	-.1
0.90	-4.22	-.221	.0232	.018	.007	0
	-2.10	-.111	.0135	.008	.005	0
	-1.03	-.060	.0110	.004	0	0
	-.49	-.035	.0103	.002	0	0
	.46	.011	.0099	-.001	-.001	0
	.99	.037	.0105	-.003	0	0
	2.07	.090	.0128	-.008	-.004	0
0.90	4.19	.199	.0217	-.017	-.003	0
	6.31	.306	.0382	-.024	-.009	-.1
	8.43	.402	.0632	-.024	-.005	-.1
	10.56	.510	.0984	-.031	-.002	0
1.20	-4.09	-.215	.0283	.038	.006	-.1
	-2.03	-.110	.0183	.019	.006	0
	-1.00	-.059	.0158	.010	.006	0
	-.47	-.033	.0151	.006	.003	0
	.45	.013	.0150	-.002	.001	0
	.98	.040	.0157	-.007	-.001	0
	2.02	.092	.0181	-.015	-.001	0
	4.08	.196	.0272	-.033	-.003	0
	6.14	.305	.0437	-.051	-.004	0
	8.20	.407	.0679	-.068	.003	0
	10.27	.513	.1001	-.084	.005	0
1.30	-4.09	-.198	.0298	.032	.001	0
	-2.03	-.102	.0206	.016	.004	0
	-1.00	-.055	.0180	.009	.003	0
	-.47	-.031	.0174	.005	.003	0
	.45	.012	.0171	-.002	.003	0
	.98	.036	.0178	-.006	.003	0
	2.02	.085	.0219	-.014	.001	0
	4.07	.181	.0288	-.030	.003	0
	6.13	.278	.0438	-.044	.006	0
	8.19	.371	.0657	-.059	.005	0
	10.25	.464	.0948	-.073	.004	0
	12.31	.555	.1304	-.087	.005	0
	14.37	.644	.1727	-.099	.003	0
1.50	-4.08	-.181	.0272	.029	.006	0
	-2.02	-.093	.0185	.015	.004	0
	-.99	-.049	.0159	.008	.003	0
	-.47	-.027	.0148	.005	.003	0
	.45	.012	.0146	-.002	.001	0
	.97	.034	.0156	-.006	.001	0
	2.02	.078	.0182	-.013	0	0
1.50	4.07	.166	.0264	-.027	-.002	0
	6.12	.254	.0402	-.040	-.003	0
	8.17	.336	.0600	-.053	-.003	0
	10.23	.419	.0940	-.066	-.004	0
	12.28	.498	.1170	-.077	-.003	0
	14.34	.575	.1550	-.087	.001	0
1.70	-4.07	-.164	.0254	.026	.004	0
	-2.02	-.085	.0173	.013	.003	0
	-.99	-.046	.0152	.007	.002	0
	-.47	-.026	.0145	.004	.001	0
	.45	.011	.0144	-.002	.001	0
	.97	.031	.0149	-.005	.006	0
	2.01	.071	.0169	-.011	0	0
	4.07	.150	.0245	-.023	-.001	0
	6.12	.226	.0370	-.035	-.002	0
	8.17	.306	.0550	-.046	-.004	0
	10.22	.376	.0777	-.057	-.005	0
	12.27	.447	.1058	-.066	-.006	0
	14.32	.516	.1393	-.075	-.007	-.1
	16.38	.582	.1773	-.081	-.011	-.1
1.90	-4.06	-.149	.0248	.022	.003	0
	-2.02	-.077	.0174	.011	.002	0
	-.99	-.042	.0157	.006	.002	0
	-.47	-.025	.0151	.004	.001	0
	.45	.008	.0150	-.001	.001	0
	.97	.026	.0154	-.004	.002	0
	2.01	.064	.0170	-.010	0	0
	4.05	.135	.0237	-.020	-.001	0
	6.10	.204	.0350	-.030	-.002	0
	8.14	.273	.0511	-.039	-.003	0
	10.19	.338	.0714	-.048	-.005	0
	12.23	.401	.0962	-.056	-.007	0
	14.28	.462	.1258	-.062	-.008	-.1
	16.33	.524	.1606	-.067	-.012	-.1
	17.36	.556	.1801	-.069	-.016	-.1

NACA

TABLE I.- AERODYNAMIC CHARACTERISTICS OF A TRIANGULAR WING EQUIPPED WITH A PADDLE CONTROL. DATA FOR ONE PADDLE CONTROL.
R = 3.0×10⁶ - Continued

$R = 3.0 \times 10^6$ - Continued

(c) Nominal δ = -4°

M	α	C_L	C_D	C_m	C_h	δ
0.60	-4.18	-0.219	0.0212	0.022	0.030	-4.1
	-2.09	-.127	.0137	.016	.029	-4.1
	-1.03	-.080	.0113	.014	.028	-4.1
	-.50	-.058	.0105	.013	.028	-4.1
	.49	-.014	---	.010	.027	-4.1
	1.02	.010	.0102	.009	.027	-4.1
	2.06	.057	.0114	.007	.026	-4.1
	4.21	.152	.0169	.001	.023	-4.1
	6.25	.252	.0284	-.005	.020	-4.1
	8.35	.350	.0502	-.009	.025	-4.1
	10.47	.457	.0807	-.010	.024	-4.1
	12.56	.545	.1160	-.008	.025	-4.1
	14.69	.656	.1637	-.011	.027	-4.1
	16.81	.762	.2159	-.012	.027	-4.1
	17.86	.812	.2489	-.011	.027	-4.1
0.80	-4.21	-.229	.0230	.026	.040	-4.0
	-2.10	-.128	.0140	.018	.037	-4.0
	-1.04	-.079	.0115	.015	.035	-4.0
	-.51	-.055	.0107	.013	.034	-4.0
	.50	-.009	.0101	.009	.032	-4.0
	1.03	.016	.0104	.008	.031	-4.0
	2.04	.064	.0118	.005	.029	-4.0
	4.16	.165	.0186	-.002	.024	-4.1
	6.28	.270	.0325	-.010	.023	-4.1
	8.39	.369	.0552	-.011	.020	-4.1
	10.51	.468	.0870	-.012	.020	-4.1
	12.63	.574	.1283	-.022	.019	-4.1
	14.77	.683	.1787	-.027	.020	-4.1
	16.89	.793	.2389	-.035	.022	-4.1
	17.96	.852	.2736	-.040	.016	-4.1
0.90	-4.23	-.247	.0268	.032	.031	-4.0
	-2.11	-.138	.0161	.021	.026	-4.0
	-1.05	-.065	.0130	.017	.025	-4.0
	-.51	-.058	.0119	.015	.024	-4.1
	-.50	-.010	.0113	.010	.024	-4.1
	1.14	.018	.0117	.008	.023	-4.1
	2.06	.070	.0148	.004	.022	-4.1

M	α	C_L	C_D	C_m	C_h	δ
0.90	4.18	0.179	0.0212	-0.006	0.023	-4.1
	6.31	.265	.0372	-.010	.024	-4.1
	8.43	.388	.0619	-.015	.028	-4.0
	10.58	.533	.1029	---	.026	-4.0
1.20	-4.08	-.229	.0302	.046	.030	-4.0
	-2.03	-.124	.0197	.027	.028	-4.0
	-1.00	-.072	.0169	.018	.028	-4.0
	-.47	-.046	.0160	.014	.027	-4.0
	.51	-.003	.0156	.006	.027	-4.0
	1.05	.029	.0161	.001	.026	-4.0
	2.04	.078	.0182	-.007	.026	-4.0
	4.10	.182	.0269	-.026	.025	-4.0
	6.15	.288	.0426	-.043	.026	-4.0
	8.21	.393	.0664	-.061	.031	-4.0
	10.30	.490	.0986	-.076	.032	-4.0
	12.37	.615	.1397	-.096	.035	-4.0
1.30	-4.08	-.209	.0312	.040	.028	-4.0
	-2.03	-.113	.0216	.024	.027	-4.0
	-1.00	-.065	.0186	.016	.027	-4.0
	-.47	-.042	.0180	.012	.027	-4.0
	-.51	.004	.0176	.005	.028	-4.0
	1.05	.027	.0182	.002	.029	-4.0
	2.04	.074	.0204	-.006	.028	-4.0
	4.09	.169	.0285	-.022	.028	-4.0
	6.15	.266	.0432	-.036	.030	-4.0
	8.20	.359	.0647	-.052	.034	-4.0
	10.28	.452	.0935	-.066	.033	-4.0
	12.34	.544	.1289	-.080	.030	-4.0
	14.40	.632	.1708	-.093	.027	-4.0
1.50	-4.08	-.189	.0268	.036	.031	-4.0
	-2.02	-.102	.0198	.022	.030	-4.0
	-.99	-.057	.0171	.014	.029	-4.0
	-.47	-.036	.0158	.011	.029	-4.0
	.52	.006	.0153	.004	.029	-4.0
	.83	.027	.0161	.001	.028	-4.0

M	α	C_L	C_D	C_m	C_h	δ
1.50	2.04	0.069	0.0185	-0.006	0.028	-4.0
	4.09	.158	.0262	-.020	.026	-4.0
	6.15	.244	.0396	-.034	.026	-4.0
	8.20	.327	.0590	-.047	.026	-4.0
	10.27	.410	.0851	-.059	.025	-4.0
	12.33	.489	.1161	-.070	.025	-4.0
	14.39	.587	.1531	-.061	.080	-4.0
1.70	-4.07	-.171	.0268	.031	.027	-4.0
	-2.02	-.092	.0184	.019	.026	-4.0
	-1.00	-.052	.0161	.012	.025	-4.0
	-.47	-.032	.0155	.009	.025	-4.0
	.51	-.006	.0152	.003	.025	-4.0
	1.05	.025	.0156	0	.025	-4.0
	2.03	.065	.0174	-.006	.024	-4.0
	4.08	.143	.0246	-.018	.023	-4.0
	6.13	.220	.0369	-.030	.023	-4.0
	8.18	.298	.0548	-.041	.022	-4.0
	10.23	.368	.0771	-.051	.021	-4.0
	12.30	.439	.1051	-.061	.020	-4.0
	14.35	.507	.1381	-.069	.018	-4.1
	16.41	.573	.1756	-.076	.013	-4.1
	17.43	.608	.1970	-.079	.009	-4.1
1.90	-4.06	-.154	.0259	.026	.020	-4.0
	-2.02	-.083	.0184	.015	.020	-4.0
	-.99	-.047	.0164	.010	.020	-4.0
	-.47	-.029	.0159	.007	.020	-4.0
	.51	-.005	.0157	.003	.019	-4.0
	1.05	.022	.0160	0	.019	-4.1
	2.03	.058	.0175	-.005	.018	-4.1
	4.07	.128	.0240	-.015	.018	-4.1
	6.12	.196	.0349	-.025	.018	-4.1
	8.17	.266	.0508	-.034	.017	-4.1
	10.21	.331	.0711	-.043	.016	-4.1
	12.26	.393	.0957	-.050	.015	-4.1
	14.32	.455	.1254	-.057	.013	-4.1
	16.38	.516	.1597	-.061	.009	-4.1
	17.41	.549	.1793	-.063	.009	-4.1

(d) Nominal δ = -8°

M	α	C_L	C_D	C_m	C_h	δ
0.60	-4.18	-0.227	0.0185	0.027	0.045	-8.0
	-2.09	-.133	.0155	.021	.044	-8.0
	-1.04	-.086	.0128	.018	.044	-8.0
	-.51	-.063	.0121	.017	.044	-8.0
	.49	-.021	.0114	.015	.042	-8.1
	1.02	.003	.0117	.014	.042	-8.1
	2.08	.049	.0130	.012	.042	-8.1
	4.13	.142	.0178	.006	.041	-8.1
	6.22	.241	.0292	.001	.042	-8.1
	8.33	.342	.0503	-.003	.045	-8.0
	10.43	.436	.0755	0	.045	-8.0
	12.54	.540	.1174	-.001	.045	-8.0
	14.65	.646	.1635	-.004	.047	-8.0
	16.79	.739	.2242	-.005	.059	-8.0
	17.83	.794	.2450	-.005	.045	-8.0
0.80	-4.21	-.240	.0162	.031	.054	-8.0
	-2.10	-.140	.0164	.024	.052	-8.0
	-1.05	-.091	.0135	.021	.052	-8.0
	-.51	-.066	.0127	.019	.051	-8.0
	.49	-.023	.0118	.016	.051	-8.0
	1.02	---	.0120	.015	.051	-8.0
	2.09	.051	---	.012	.051	-8.0
	4.15	.150	---	.061	.051	-8.0
	6.27	.255	.0328	-.002	.051	-8.0
	8.39	.354	.0547	-.002	.052	-8.0
	10.50	.448	.0844	-.002	.055	-7.9
	12.62	.563	.1260	.001	.051	-7.9
	14.73	.675	.1770	.021	.051	-8.0
	16.86	.786	.2372	-.028	.049	-8.0
	17.94	.843	.2708	-.034	.041	-8.0
0.90	-4.24	-.263	.0308	.040	.058	-7.9
	-1.99	---	.0160	---	.059	-7.9
	-1.06	---	.0161	.026	.061	-7.9
	-.53	-.073	.0150	.023	.062	-7.9
	.48	-.026	.0139	.020	.061	-7.9
	1.02	-.002	.0142	.018	.061	-7.9
	2.10	.052	---	.014	.058	-7.9

M	α	C_L	C_D	C_m	C_h	δ
0.90	4.17	0.160	0.0232	0.004	0.057	-7.9
	6.30	.268	.0394	-.003	.058	-7.9
	8.42	.375	.0668	-.008	.061	-7.9
	10.57	.425	.0970	-.016	.058	-7.9
1.20	-4.09	-.242	.0530	.053	.082	-7.6
	-2.03	-.135	.0321	.034	.080	-7.6
	-.10	-.083	.0190	.025	.082	-7.6
	-.48	-.058	.0181	.021	.081	-7.6
	.51	-.009	.0175	.013	.079	-7.6
	1.04	.018	.0179	.008	.078	-7.6
	2.03	.068	.0212	0	.077	-7.6
	4.08	.172	.0261	-.018	.076	-7.6
	6.15	.279	.0438	-.036	.077	-7.6
	8.21	.383	.0673	-.054	.084	-7.6
	10.27	.489	.0968	-.069	.084	-7.6
	12.34	.607	.1355	-.090	.081	-7.6
1.30	-4.08	-.221	.0343	.047	.083	-7.6
	-2.02	-.123	.0242	.033	.079	-7.6
	-1.00	-.075	.0211	.022	.081	-7.6
	-.51	-.032	.0202	.019	.079	-7.6
	-.51	-.006	.0195	.012	.076	-7.6
	1.04	.018	.0201	.008	.076	-7.6
	2.03	.066	.0221	0	.075	-7.6
	4.08	.160	.0299	-.016	.072	-7.7
	6.14	.257	.0442	-.035	.074	-7.6
	8.20	.351	.0656	-.047	.076	-7.6
	10.26	.447	.0941	-.062	.073	-7.7
	12.32	.537	.1291	-.075	.073	-7.7
	14.38	.625	.1704	-.088	.068	-7.7
1.50	-4.07	-.202	.0311	.043	.078	-7.6
	-2.02	-.111	.0250	.028	.076	-7.6
	-.99	-.058	.0186	.021	.075	-7.6
	-.47	-.047	.0174	.018	.075	-7.6
	.51	-.007	.0170	.011	.074	-7.6
	1.04	.017	.0177	.008	.074	-7.6
	2.02	.060	.0198	.001	.073	-7.6

M	α	C_L	C_D	C_m	C_h	δ
1.50	4.08	0.147	0.0272	-0.014	0.072	-7.6
	6.13	.235	.0404	-.028	.073	-7.6
	8.19	.321	.0596	-.041	.078	-7.6
	10.24	.401	.0849	-.054	.083	-7.7
	12.29	.483	.1159	-.067	.068	-7.7
	14.35	.562	.1528	-.078	.064	-7.7
	16.40	.636	.1949	-.088	.059	-7.7
1.70	-4.07	-.180	.0290	.037	.063	-7.7
	-2.02	-.101	.0203	.024	.063	-7.7
	-.99	-.061	.0177	.018	.062	-7.7
	-.47	-.042	.0168	.015	.061	-7.7
	.51	-.004	.0164	.009	.061	-7.7
	1.03	-.018	.0168	.005	.061	-7.7
	2.02	.057	.0196	-.001	.060	-7.7
	4.07	.134	.0255	-.013	.060	-7.7
	6.12	.211	.0375	-.025	.060	-7.7
	8.17	.288	.0548	-.036	.058	-7.7
	10.21	.358	.0769	-.046	.058	-7.7
	12.26	.429	.1042	-.056	.057	-7.8
	14.31	.498	.1362	-.065	.048	-7.8
	16.37	.565	.1742	-.072	.050	-7.8
	17.40	.600	.1949	-.075	.046	-7.8
1.90	-4.06	-.161	.0276	.030	.056	-7.8
	-2.01	-.090	.0198	.020	.055	-7.8
	-.99	-.054	.0178	.014	.055	-7.8
	-.47	-.036	.0171	.012	.055	-7.8
	.51	-.003	.0168	.007	.054	-7.8
	1.03	-.017	.0170	.004	.054	-7.8
	2.01	.051	.0193	-.001	.054	-7.8
	4.06	.121	.0243	-.011	.054	-7.8
	6.10	.190	.0351	-.021	.053	-7.8
	8.14	.259	.0505	-.031	.052	-7.8
	10.19	.325	.0708	-.039	.051	-7.8
	12.23	.385	.0943	-.046	.050	-7.8
	14.28	.446	.1231	-.052	.048	-7.8
	16.33	.506	.1566	-.057	.041	-7.8
	17.36	.538	.1760	-.059	.041	-7.9

NACA

TABLE I.- AERODYNAMIC CHARACTERISTICS OF A TRIANGULAR WING EQUIPPED
WITH A PADDLE CONTROL. DATA FOR ONE PADDLE CONTROL.
R = 3.0×10⁶ - Concluded

(e) Nominal δ = -12°

M	α	C_L	C_D	C_m	C_h	δ	M	α	C_L	C_D	C_m	C_h	δ	M	α	C_L	C_D	C_m	C_h	δ
0.60	-4.18	-0.228	0.0270	0.027	0.060	-12.0	0.90	4.17	0.158	0.0256	0.006	0.074	-11.8	1.50	2.08	0.054	0.0235	0.005	0.091	-11.6
	-2.09	-.136	.0191	.021	.058	-12.0		6.30	.265	.0411	-.001	.084	-11.8		4.08	.139	.0306	-.009	.087	-11.6
	-1.04	-.069	.0165	.018	.057	-12.0		8.43	.368	.0654	-.003	.091	-11.7		6.13	.226	.0434	-.023	.084	-11.6
	-.51	-.066	.0156	.017	.057	-12.0		10.55	.473	.0985	-.010	.092	-11.7		8.19	.312	.0625	-.036	.084	-11.6
	.48	-.026	.0148	.016	.057	-12.0									10.24	.394	.0869	-.050	.079	-11.7
	1.01	-.003	.0149	.015	.056	-12.0	1.20	-4.08	-.250	.0369	.059	.100	-11.6		12.29	.475	.1169	-.063	.072	-11.7
	2.07	.044	.0160	.013	.056	-12.1		-2.22	-.142	.0258	.040	.101	-11.6		14.35	.553	.1532	-.075	.067	-11.8
	4.12	.133	.0204	.009	.054	-12.1		-.10	-.091	.0227	.031	.103	-11.5		16.41	.628	.1950	-.085	.062	-11.8
	6.28	.231	.0309	.004	.054	-12.1		-.48	-.066	.0217	.027	.102	-11.5							
	8.32	.330	.0500	.002	.054	-12.1		.51	-.019	.0209	.019	.101	-11.6	1.70	-4.06	-.186	.0321	.042	.093	-11.5
	10.43	.424	.0773	.005	.054	-12.1		1.04	-.010	.0212	.014	.100	-11.6		-2.01	-.106	.0232	.030	.092	-11.6
	12.54	.526	.1159	.004	.054	-12.1		2.03	-.060	.0230	.006	.099	-11.6		-.99	-.067	.0205	.023	.091	-11.6
	14.65	.630	.1609	.001	.057	-12.0		4.09	.162	.0308	-.012	.099	-11.6		-.47	-.047	.0197	.020	.090	-11.6
	16.76	.732	.2133	0	.058	-12.0		6.15	.268	.0455	-.030	.101	-11.6		.51	-.011	.0192	.014	.090	-11.6
	17.82	.789	.2446	0	.057	-12.0		8.21	.372	.0695	-.047	.104	-11.5		1.04	.011	.0195	.011	.089	-11.6
0.80	-4.22	-.242	.0293	.033	.062	-12.0		10.26	.479	.1001	-.063	.104	-11.5		2.08	.050	.0212	.005	.089	-11.6
	-2.11	-.143	.0196	.025	.060	-12.0		12.33	.598	.1408	-.084	.100	-11.6		4.75	.127	.0278	-.007	.089	-11.6
	-1.05	-.093	.0168	.022	.059	-12.0									6.13	.204	.0394	-.019	.088	-11.6
	-.52	-.068	.0158	.020	.058	-12.0	1.30	-4.08	-.230	.0384	.053	.094	-11.6		8.18	.281	.0564	-.030	.086	-11.6
	.48	-.025	.0150	.018	.058	-12.0		-2.21	-.130	.0279	.036	.094	-11.6		10.23	.352	.0784	-.041	.087	-11.6
	1.02	-.002	.0151	.016	.057	-12.0		-.99	-.082	.0249	.028	.096	-11.6		12.28	.425	.1059	-.052	.084	-11.6
	2.09	-.048	.0165	.014	.057	-12.0		-.48	-.058	.0238	.024	.095	-11.6		14.33	.495	.1361	-.061	.077	-11.7
	4.15	.144	.0220	.008	.056	-12.0		.51	-.014	.0230	.016	.093	-11.6		16.39	.563	.1779	-.069	.071	-11.7
	6.27	.248	.0351	.001	.057	-12.0		1.04	-.011	.0234	.012	.092	-11.6		17.41	.599	.1973	-.073	.069	-11.7
	8.38	.342	.0561	.003	.062	-12.0		2.03	.057	.0253	.004	.091	-11.6							
	10.50	.438	.0857	.004	.067	-11.9		4.08	.154	.0326	-.012	.087	-11.6	1.90	-4.05	-.166	.0347	.035	.085	-11.7
	12.62	.549	.1257	-.008	.065	-11.9		6.14	.250	.0468	-.028	.086	-11.6		-2.01	-.094	.0226	.024	.084	-11.7
	14.73	.661	.1756	-.015	.069	-11.9		8.20	.343	.0678	-.042	.087	-11.6		-.99	-.059	.0204	.019	.083	-11.7
	16.87	.766	.2327	-.021	.071	-11.9		10.26	.436	.0956	-.057	.085	-11.7		-.47	-.041	.0198	.016	.083	-11.7
	17.93	.820	.2650	-.026	.068	-11.9		12.32	.529	.1300	-.071	.083	-11.7		.51	-.009	.0193	.011	.083	-11.7
0.90	-4.24	-.263	.0338	.040	.062	-11.8		14.38	.618	.1712	-.084	.078	-11.7		1.03	.008	.0194	.009	.082	-11.7
	-2.06	-.108	.0205	.033	.078	-11.8									2.01	.046	.0207	.004	.082	-11.7
	-1.06	-.098	.0190	.025	.080	-11.8	1.50	-4.07	-.208	.0348	.049	.086	-11.6		4.06	.119	.0268	-.007	.082	-11.7
	.49	-.026	.0168	.020	.077	-11.8		-2.02	-.120	.0252	.034	.087	-11.6		6.10	.184	.0374	-.016	.082	-11.7
	1.03	.001	.0170	.018	.076	-11.8		-.99	-.077	.0220	.027	.087	-11.6		8.15	.252	.0528	-.026	.080	-11.7
	2.10	.053	.0188	.014	.078	-11.8		-.47	-.055	.0208	.024	.086	-11.6		10.19	.320	.0728	-.034	.079	-11.7
								.51	-.015	.0203	.017	.092	-11.6		12.24	.380	.0962	-.041	.077	-11.7
								1.04	.008	.0210	.013	.092	-11.6		14.28	.440	.1243	-.047	.068	-11.8
															16.33	.502	.1579	-.053	.064	-11.8
															17.36	.534	.1774	-.058	.065	-11.8

(f) Nominal δ = -16°

M	α	C_L	C_D	C_m	C_h	δ	M	α	C_L	C_D	C_m	C_h	δ	M	α	C_L	C_D	C_m	C_h	δ
0.60	-4.18	-0.224	0.0310	0.025	0.067	-16.0	0.90	6.30	0.259	0.0460	0.002	0.115	-15.7	1.50	4.08	0.133	0.0341	-0.005	0.099	-15.5
	-2.09	-.130	.0230	.020	.066	-16.0		8.42	.359	.0694	.001	.120	-15.6		6.14	.219	.0465	-.019	.098	-15.5
	-1.04	-.087	.0205	.018	.066	-16.0		10.54	.466	.1022	-.007	.121	-15.6		8.19	.306	.0652	-.032	.098	-15.5
	-.51	-.064	.0196	.017	.066	-16.0									10.24	.389	.0892	-.047	.092	-15.6
	.49	-.022	.0186	.015	.067	-16.0	1.20	-4.08	-.253	.0420	.064	.117	-15.4		12.30	.471	.1192	-.060	.088	-15.6
	1.02	.003	.0189	.014	.064	-16.0		-2.02	-.149	.0309	.044	.117	-15.4		14.35	.551	.1557	-.072	.083	-15.6
	2.08	.049	.0201	.012	.063	-16.0		-.99	-.096	.0276	.035	.119	-15.4							
	4.12	.136	.0245	.009	.063	-16.0		-.48	-.070	.0266	.031	.119	-15.4	1.70	-4.06	-.195	.0363	.048	.090	-15.6
	6.22	.232	.0348	.004	.066	-16.0		.51	-.024	.0256	.023	.118	-15.4		-2.01	-.117	.0271	.035	.089	-15.6
	8.32	.329	.0539	.002	.069	-16.0		1.04	.004	.0260	.018	.117	-15.4		-.99	-.077	.0244	.029	.089	-15.6
	10.42	.420	.0800	.006	.072	-16.0		2.09	.056	.0276	-.010	.117	-15.4		-.47	-.058	.0235	.026	.089	-15.6
	12.54	.508	.1175	.005	.073	-16.0		4.09	.156	.0351	-.008	.118	-15.4		.51	-.021	.0227	.020	.088	-15.6
	14.64	.627	.1630	.003	.076	-16.0		6.15	.262	.0500	-.026	.119	-15.4		1.03	.001	.0229	.017	.088	-15.6
	16.76	.732	.2179	.003	.077	-16.0		8.21	.367	.0730	-.043	.122	-15.4		2.08	.041	.0244	.010	.088	-15.6
	17.82	.782	.2470	.003	.076	-16.0		10.26	.474	.1032	-.058	.119	-15.4		4.06	.093	.0291	.002	.087	-15.6
0.80	-4.21	-.296	.0333	.029	.072	-15.9		12.33	.593	.1438	-.080	.114	-15.5		6.12	.196	.0432	-.015	.089	-15.6
	-2.10	-.135	.0240	.021	.071	-15.9									8.17	.274	.0597	-.027	.086	-15.6
	-1.05	-.087	.0211	.018	.071	-15.9	1.30	-4.07	-.235	.0428	.059	.106	-15.5		10.22	.346	.0804	-.039	.080	-15.7
	-.51	-.063	.0202	.017	.071	-15.9		-2.02	-.138	.0323	.042	.108	-15.5		12.27	.418	.1069	-.049	.075	-15.7
	.49	-.020	.0194	.014	.070	-15.9		-.99	-.090	.0292	.033	.112	-15.5		14.32	.488	.1389	-.059	.073	-15.7
	1.02	.005	.0196	.013	.070	-15.9		-.48	-.068	.0281	-.030	.112	-15.5		16.38	.558	.1766	-.067	.069	-15.8
	2.10	.054	.0209	.010	.069	-15.9		-.51	-.022	.0272	.022	.110	-15.5		17.41	.593	.1978	-.071	.067	-15.8
	4.16	.150	.0267	.004	.067	-15.9		1.04	.004	.0274	.018	.109	-15.5							
	6.27	.253	.0401	-.003	.069	-15.9		2.09	.054	.0291	.009	.108	-15.5	1.90	-4.06	-.175	.0345	.039	.080	-15.7
	8.38	.343	.0605	.001	.071	-15.9		4.09	.147	.0363	-.007	.107	-15.5		-2.01	-.103	.0262	.029	.080	-15.7
	10.50	.431	.0885	.006	.081	-15.8		6.14	.244	.0501	-.024	.107	-15.5		-.99	-.068	.0238	.024	.079	-15.7
	12.62	.548	.1297	-.007	.078	-15.9		8.20	.338	.0709	-.039	.107	-15.5		-.47	-.050	.0231	.021	.079	-15.7
	14.73	.657	.1781	-.013	.084	-15.8		10.26	.435	.0986	-.054	.106	-15.5		.51	-.017	.0225	.016	.079	-15.7
	16.87	.762	.2355	-.018	.091	-15.8		12.32	.525	.1325	-.068	.103	-15.6		1.03	.002	.0226	.013	.078	-15.7
0.90	-4.24	-.267	.0394	.043	.106	-15.7		14.38	.617	.1741	-.082	.098	-15.6		2.07	.039	.0238	.008	.078	-15.7
	-2.12	-.157	.0279	.032	.103	-15.7									4.06	.108	.0295	-.002	.078	-15.7
	-1.06	-.104	.0243	.027	.103	-15.7	1.50	-4.07	-.214	.0400	.053	.097	-15.5		6.11	.173	.0396	-.012	.078	-15.7
	-.53	-.079	.0232	.025	.102	-15.7		-2.02	-.125	.0301	.038	.098	-15.5		8.15	.244	.0543	-.021	.076	-15.7
	.48	-.032	.0221	.022	.101	-15.7		-.99	-.081	.0270	.031	.102	-15.5							
	1.02	-.007	.0222	.020	.100	-15.7		-.47	-.062	.0257	.028	.100	-15.5		12.25	.371	.0961	-.037	.065	-15.8
	2.10	.047	.0236	.017	.100	-15.7		.51	-.021	.0248	.021	.099	-15.5		14.29	.434	.1259	-.045	.062	-15.8
	4.17	.133	.0274	.008	.101	-15.7		1.03	.002	.0254	.017	.100	-15.5		16.33	.497	.1596	-.050	.058	-15.8
								2.08	.047	.0293	.097	.101	-15.5		17.37	.529	.1790	-.053	.058	-15.8

Equation of fuselage ordinates

$$\frac{r}{r_0} = \left[1 - \left(1 - \frac{2x}{l}\right)^2\right]^{\frac{3}{4}}$$

59.50

46.93

15.86

26.46

1.276

.383

7.125

26.46

$r_0 = 2.38$

$\bar{c} = 17.65$

63° 26'

8.81

11.17

x

r

A   A
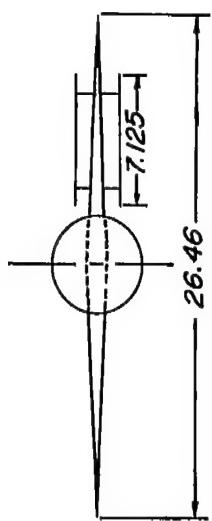
Dimensions in inches

.063

.30
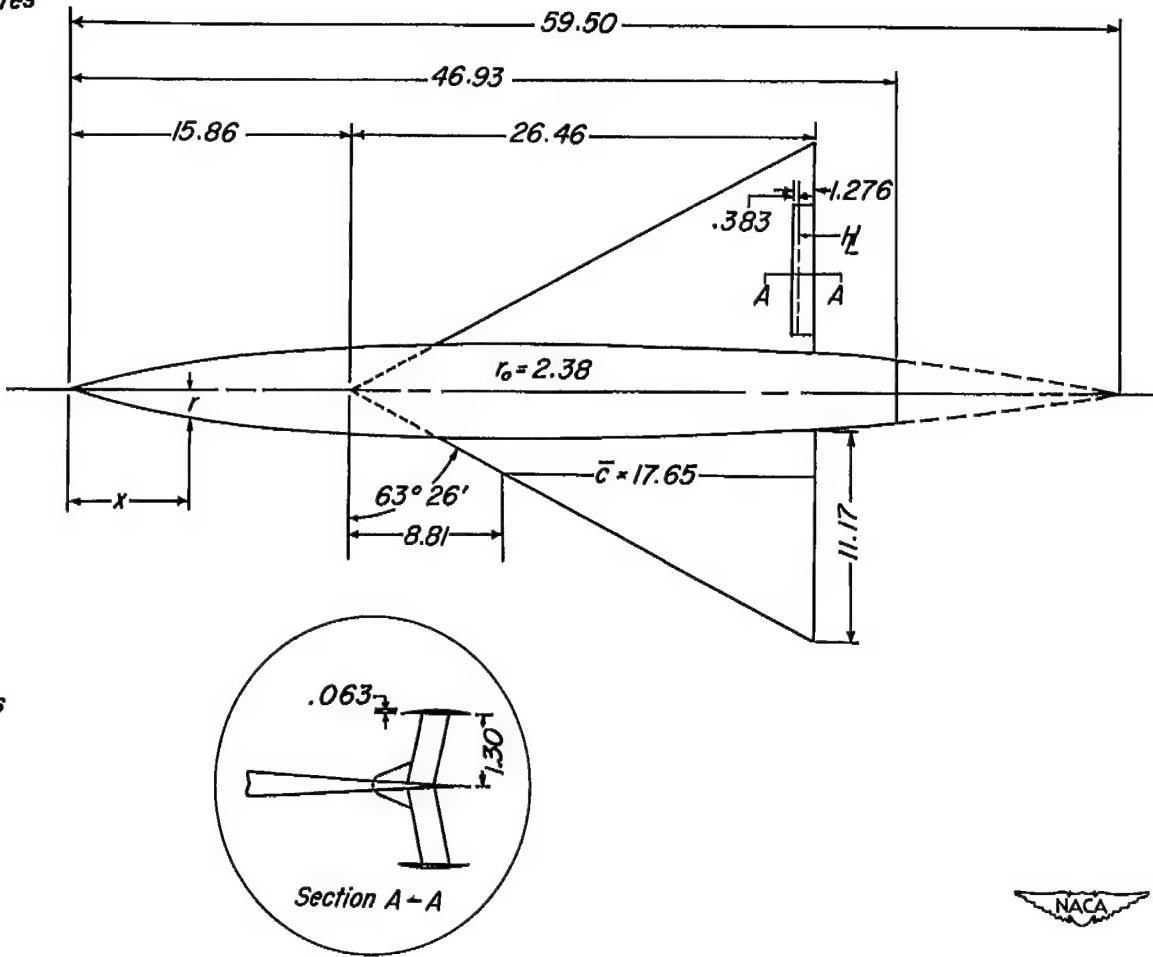
Section A - A

Figure I.- Dimensional sketch of model.
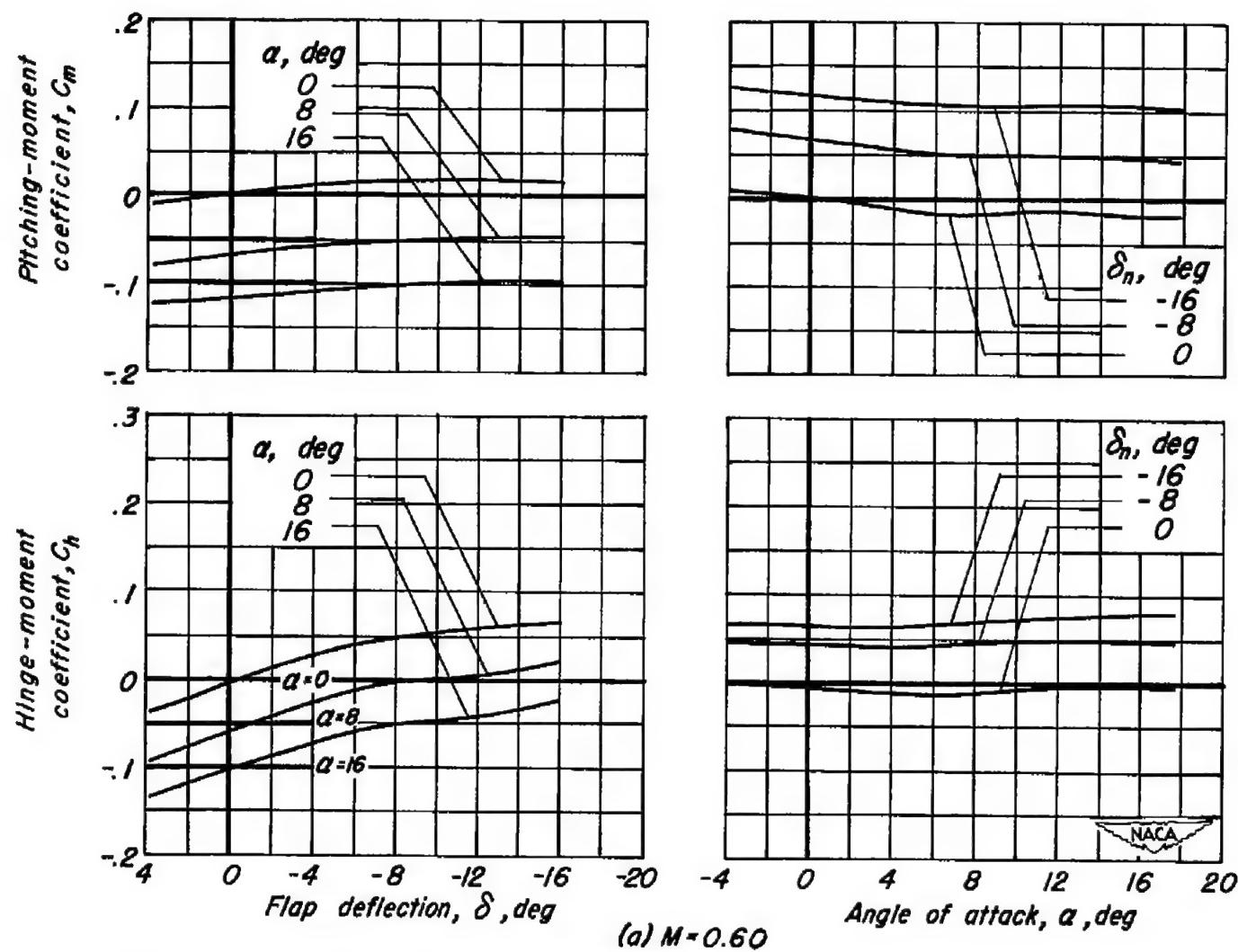
Figure 2.- The variation of the pitching-moment and the hinge-moment coefficients with paddle-control deflection and with angle of attack. Data for one paddle control. $R = 3.0 \times 10^6$.

(a) $M = 0.60$
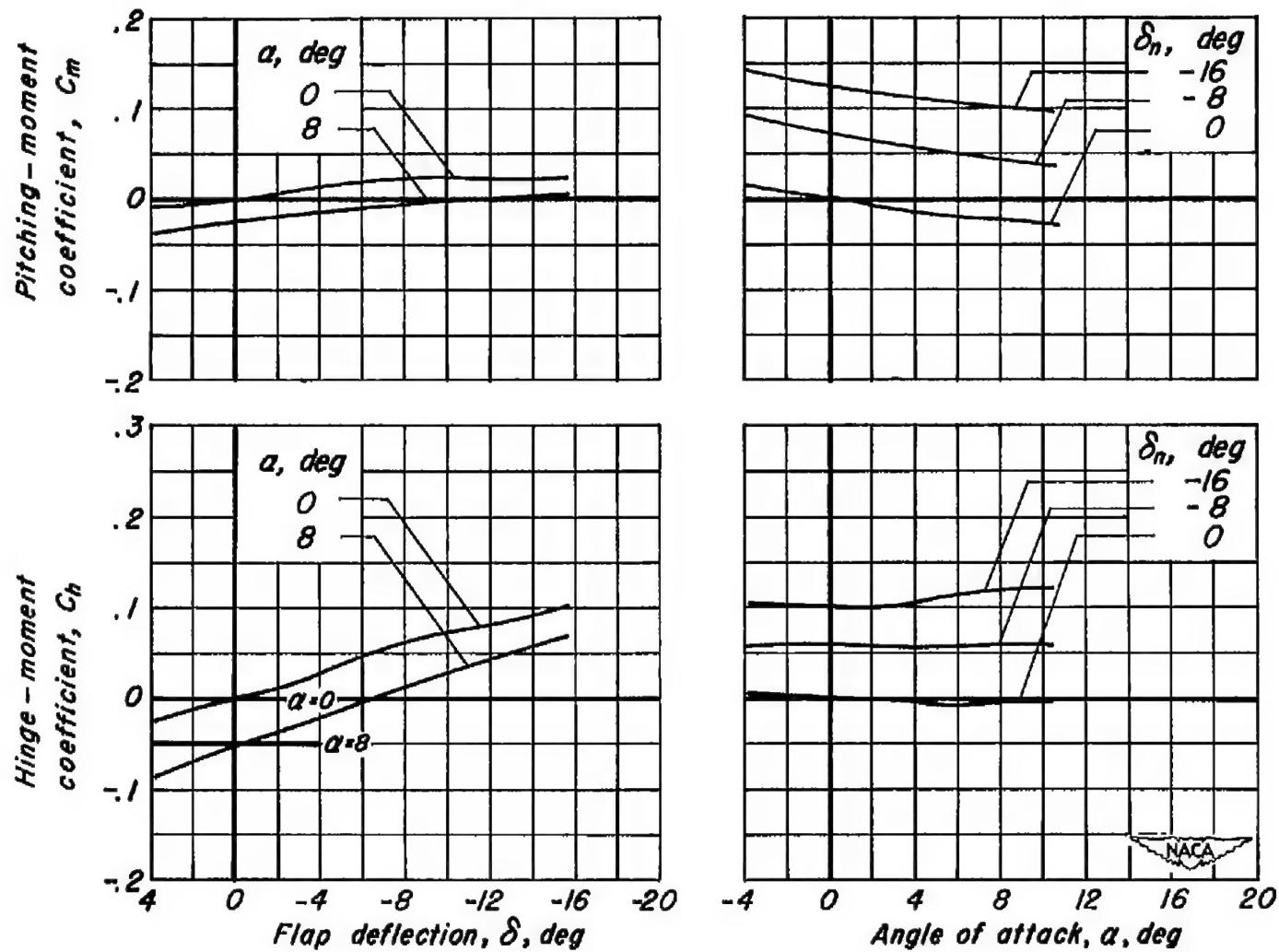
(b) M=0.90

Figure 2.- Continued.
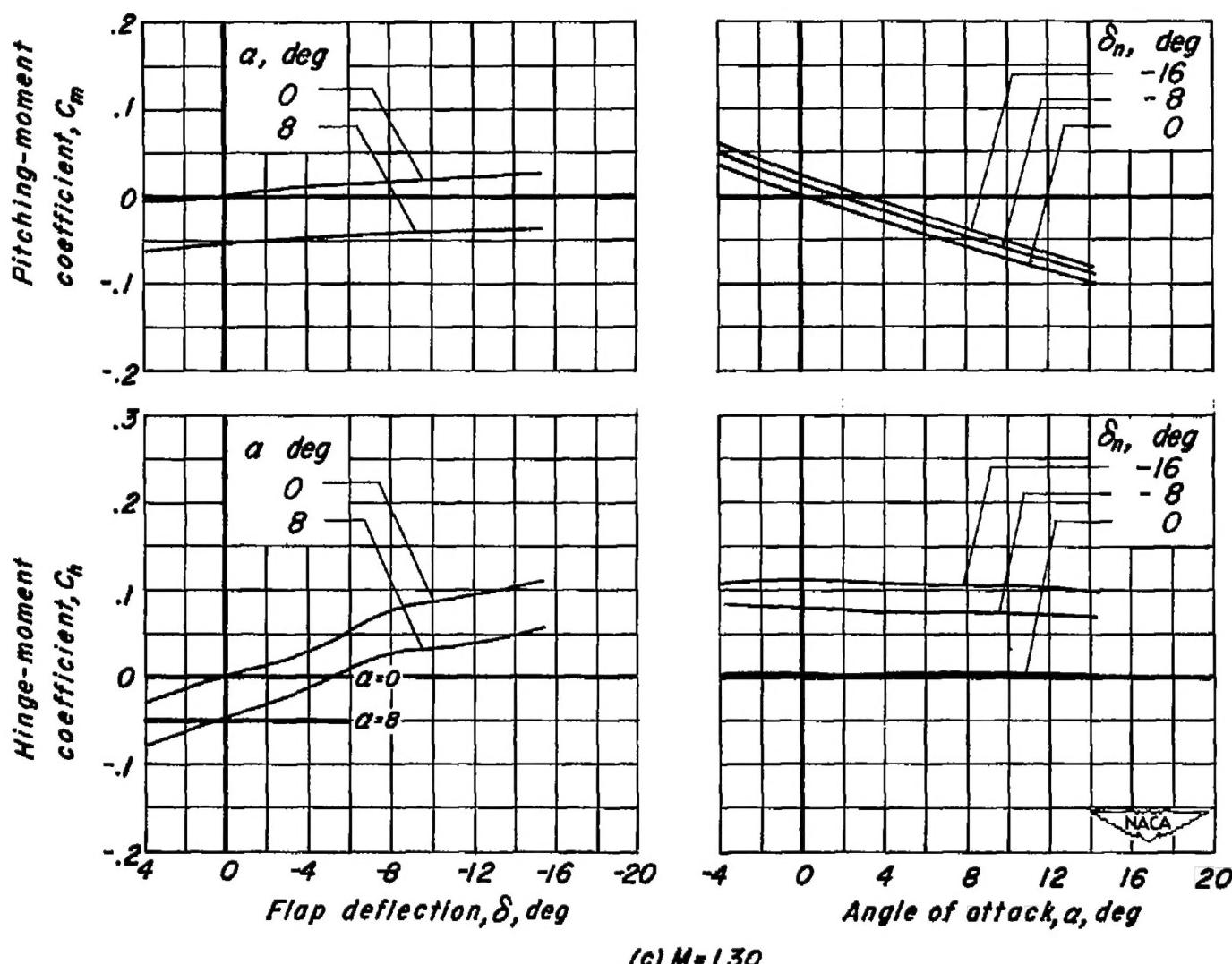
(c) M = 1.30

Figure 2.- Continued.
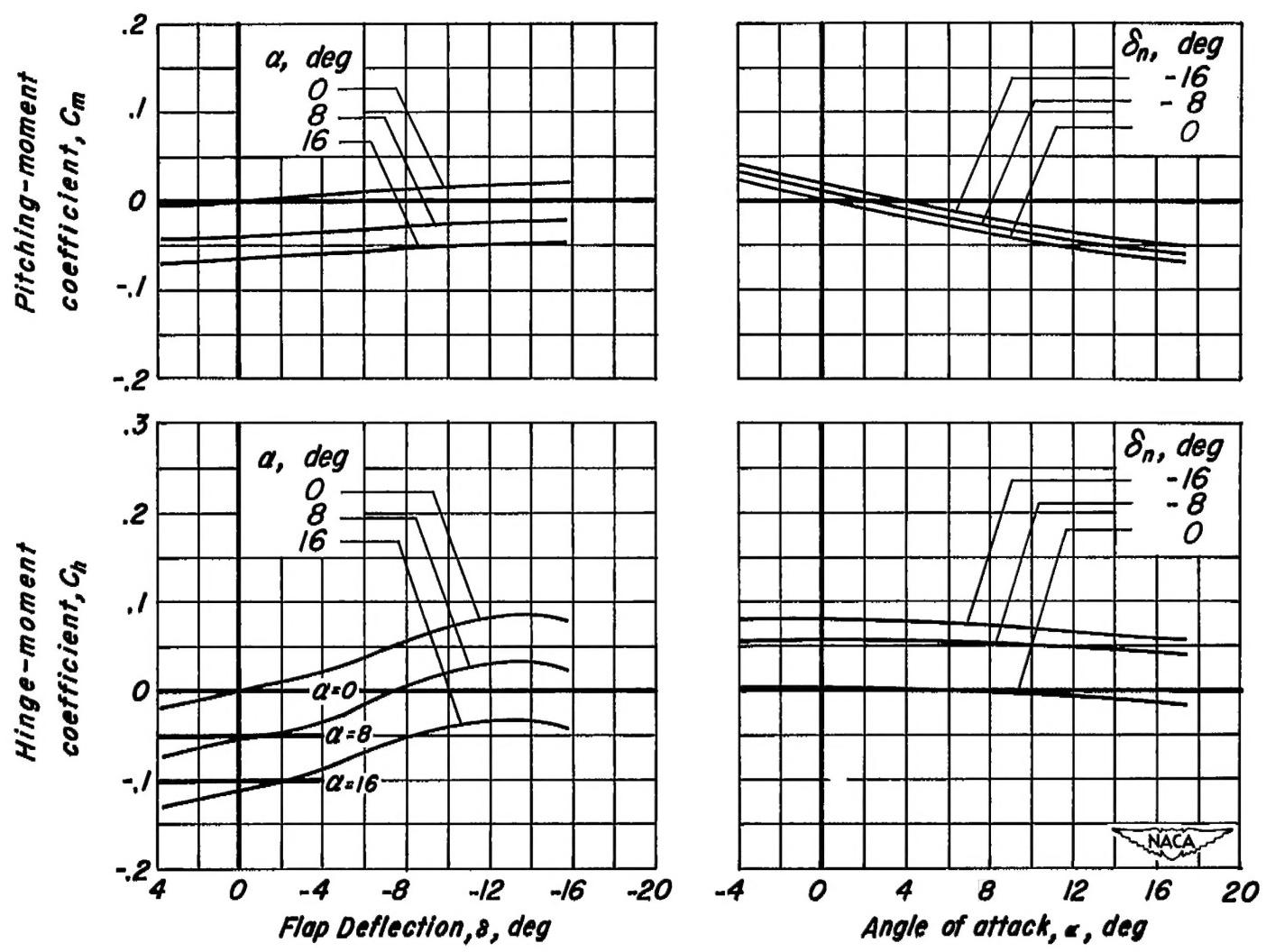
(d) M = 1.90

Figure 2.- Concluded.
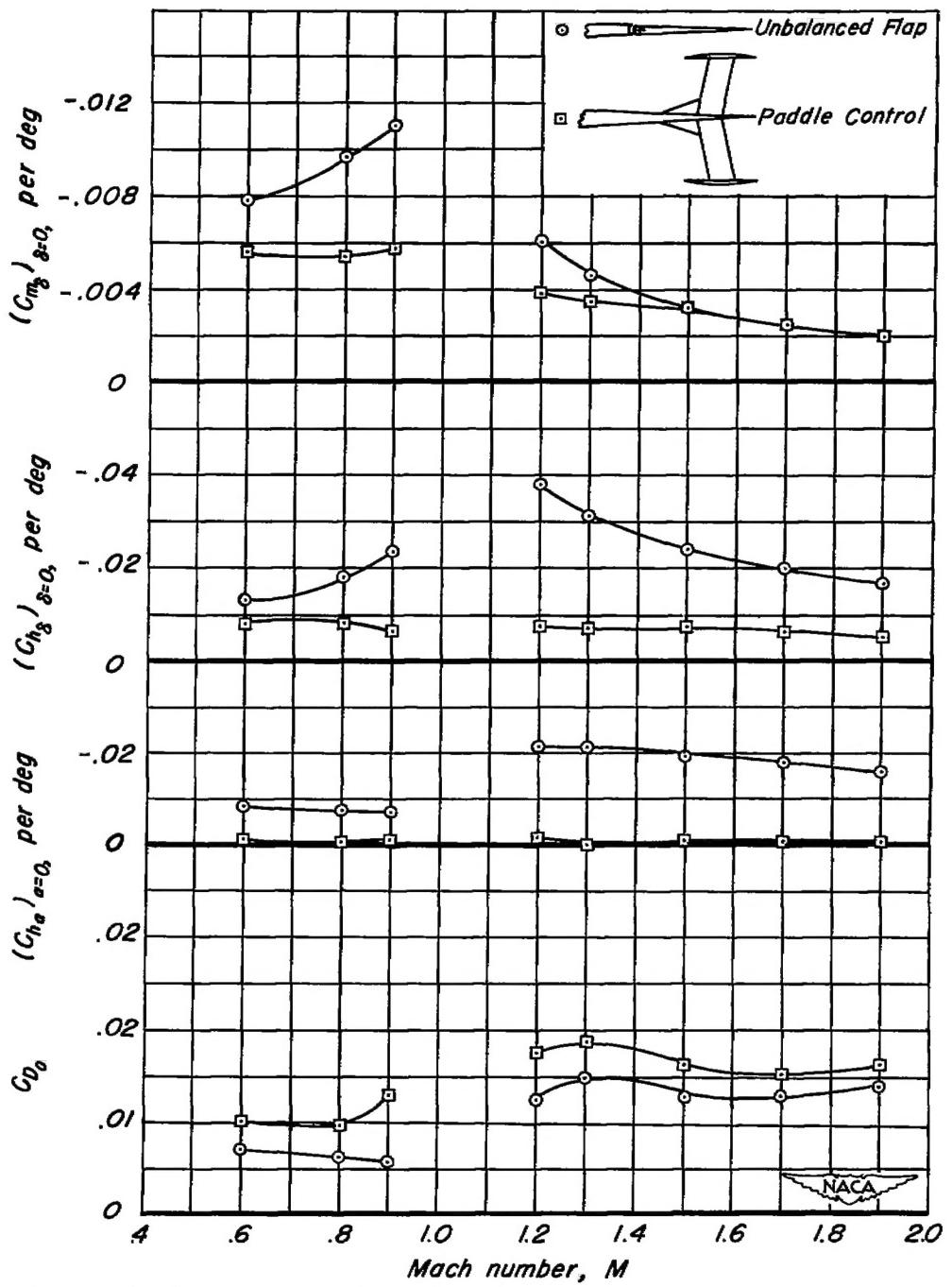
Figure 3.-Variation with Mach number of the pitching-moment-effectiveness parameter, C_{m_δ}, the hinge-moment parameters, C_{h_δ}, and C_{h_α}, and the minimum drag coefficient, C_{D_o}, for the unbalanced flap and the paddle-control configurations. Data for two flaps.